

REMARKS

Claims 1, 2 and 6-19 are all the claims pending in the application.

Claims 1 and 2 are amended for clarification as shown in the Amendments to the Claims and as reproduced below in Applicants' response to the obviousness rejections. Support can be found, for example, at page 5, lines 15-18 and page 8, lines 13-26 of the specification as originally filed. No new matter is added.

Entry of the Amendment along with reconsideration and review of the claims on the merits are respectfully requested.

Response to Claim Rejections - 35 U.S.C. § 103

A. Claims 1, 6-8, 10-14, 18 and 19 are rejected under 35 U.S.C. §103(a) as assertedly being unpatentable over Mostafazadeh et al. in view of Lin et al. and Senoo et al. (U.S. Patent No. 5,705,016) and as evidenced by High Performance Films, for the reasons of record.

The Examiner recognizes that neither Mostafazadeh nor Lin discloses the type of adhesive used. The Examiner cites Senoo et al. as disclosing a pressure sensitive adhesive used to hold wafers in place for dicing which has a low adhesive strength (less than 300 gf/25cm) to prevent the adhesive from sticking to the frame around the wafer, where the adhesive can be silicone based. The Examiner concludes that it would have been obvious to one of ordinary skill in the art to use any of the adhesives of Senoo et al., such as one based on silicone, on the film of Lin et al. in the process of Mostafazadeh et al. since the adhesive can hold electronic parts securely and prevents the transfer of adhesive to the material it is attached to.

B. Claim 9 is rejected under 35 U.S.C. §103(a) as assertedly being unpatentable

over the references as applied to claim 1 above, and further in view of Wang (U.S. Patent No. 6,306,497), for the reasons of record.

The Examiner recognizes that the references cited above do not disclose the adhesive containing a heat resistant filler. The Examiner cites Wang as disclosing a method of controlling the peel strength of an adhesive by controlling the number of glass microspheres in the adhesive.

C. Claim 15 is rejected under 35 U.S.C. §103(a) as assertedly being unpatentable over the references as applied to claim 1 above, and further in view of Kraft et al. (U.S. Patent No. 4,240,938), for the reasons of record.

The Examiner recognizes that the references cited above do not disclose surface roughening the substrate before applying the adhesive to it. The Examiner states that it is well-known and conventional in the adhesive arts in general to roughen a surface prior to applying adhesive to provide a better surface for the adhesive to bond to.

D. Claims 16 and 17 are rejected under 35 U.S.C. §103(a) as assertedly being unpatentable over the references as applied to claim 1 above, and further in view of Fjelstad (U.S. Patent No. 6,001,671), for the reasons of record.

The Examiner recognizes that the references cited above do not disclose the adhesive containing heat-conductive particles. The Examiner cites Fjelstad as disclosing an adhesive adjacent a chip which contains heat-conductive particles so there is a path to draw heat away from the chip during thermal processing.

E. Claims 2, 6-8, 10-14, 18, and 19 are rejected under 35 U.S.C. §103(a) as being unpatentable over Mostafazadeh et al. in view of Lin et al., Senoo et al., and High Performance Films as applied to claim 1 above, and further in view of Oida et al. (WO 98/35382), for the reasons of record, citing U.S. Patent 6,291,274 as an English language translation of Oida et al.

The Examiner recognizes that the references cited above do not disclose replacing the lead frame of Mostafazadeh et al. with a tape carrier. The Examiner cites Oida et al. as disclosing that tape carriers can be used in place of lead frames when encapsulating chips in resin.

F. Claim 9 is rejected under 35 U.S.C. §103(a) as assertedly being unpatentable over the references as applied to claim 2 above, and further in view of Wang (U.S. Patent No. 6,306,497), for the reasons of record.

G. Claim 15 is rejected under 35 U.S.C. §103(a) as assertedly being unpatentable over the references as applied to claim 2 above, and further in view of Kraft et al. (U.S. Patent No. 4,240,938), for the reasons of record.

H. Claims 16 and 17 are rejected under 35 U.S.C. §103(a) as assertedly being unpatentable over the references as applied to claim 2 above, and further in view of Fjelstad (U.S. Patent No. 6,001,671), for the reasons of record.

Applicants respond as follows.

Applicants focus their comments on independent Claims 1-2, as the remaining claims are dependent therefrom.

Claims 1 and 2 are amended for clarification as previously noted and as shown below:

1. (currently amended): A resin encapsulating method for a semiconductor chip comprising adhering a silicone-based pressure-sensitive adhesive tape to a leadframe, bonding a semiconductor chip to the leadframe having the silicone-based pressure-sensitive adhesive tape adhered thereto, encapsulating the semiconductor chip with a resin in a mold, said resin being heated in the encapsulation step to a temperature of at least 180°C whereby the silicon-based

pressure-sensitive adhesive tape is heated at least locally to a temperature of at least 180°C
during the encapsulation step, and stripping the silicone-based pressure-sensitive adhesive tape,
wherein the silicone-based pressure-sensitive adhesive tape after being heated to a
temperature of at least 180°C in the encapsulation step has a thermal shrinkage of 3% or less on
~~resin encapsulating~~ and a pressure-sensitive adhesive strength of 400gf/20 mm or less at 23°C
after being heated to a temperature of at least 180°C in the encapsulation step followed by
cooling~~after the silicone-based adhesive tape being heated at 180°C.~~

2. (currently amended): A resin encapsulating method for a semiconductor chip comprising adhering a silicone-based pressure-sensitive adhesive tape to a tape carrier film, bonding a semiconductor chip to the tape carrier film having the silicone-based pressure-sensitive adhesive tape adhered thereto, encapsulating the semiconductor chip with a resin in a mold, said resin being heated in the encapsulation step to a temperature of at least 180°C whereby the silicon-based pressure-sensitive adhesive tape is heated at least locally to a temperature of at least 180°C during the encapsulation step, and stripping the silicone-based pressure-sensitive adhesive tape,

wherein the silicone-based pressure-sensitive adhesive tape after being heated to a
temperature of at least 180°C in the encapsulation step has a thermal shrinkage of 3% or less on
resin encapsulating and a pressure-sensitive adhesive strength of 400gf/20 mm or less at 23°C
after being heated to a temperature of at least 180°C in the encapsulation step followed by
cooling~~after the silicone-based adhesive tape being heated at 180°C.~~

As shown in the amended Claims 1-2, Applicants clarify the heating step of the present

invention. The Examiner believes that the “claim does not actually require heating the adhesive to 180°C.” Thus, Applicants clarify this step in Claims 1-2. Applicants also clarify Claims 1-2 to indicate that Applicants’ claimed adhesive is to be used as an adhesive tape after heating.

Regarding the Examiner’s comments as to Senoo, the Examiner does not point to Senoo’s adhesive tapes being heated to any given temperature. Applicants point out that Senoo’s examples disclose that a dicing sheet including an acrylic adhesive containing thermosetting epoxy resin was heated to 40°C for three days (see Example 1, column 8, line 60 to column 9, line 14; see also Example 3, column 9, lines 55-61, disclosing the use of a silicone release agent in addition to an acrylic adhesive). Applicants submit that the disclosure and teachings of Mostafazadeh, Senoo and any of the other cited references, either individually or in combination, do not render obvious Applicants’ specifically claimed requirement in independent Claims 1 and 2 of having a pressure-sensitive adhesive strength of 400 gf/20 mm or less at 23°C after the adhesive tape has been heated to a temperature of at least 180°C, followed by cooling to room temperature.

Although the Examiner states that one skilled in the art would expect that the adhesive would have the same adhesive strength if heated to a higher temperature, Applicants point to the Examples in the present application starting at page 8 of the specification as originally filed, which provide evidence to support different adhesive strengths based on the temperature to which the adhesive is raised, as well as the duration of heating.

In general, when an ordinary adhesive tape is heated to a temperature of 180°C, one would not expect that the adhesive tape would have the same adhesive strength because polymers contained therein would be decomposed. Thus, the heated adhesive tape may not even work as an adhesive tape.

Senoo discloses a low adhesive strength of less than 300 gf/25 cm, presumably at room temperature, but this range and units of measurement are different from what Applicants claim. Since there is also a difference in temperature conditions between the present invention and Senoo's disclosure, Senoo's values are not appropriate to compare to the range of the present invention. Whereas Applicants claim a preferred embodiment of a PSA tape having a PSA strength of 400 gf/20 mm or less at 23° C after the adhesive tape has been heated to about 180°C or higher, Senoo discloses a PSA strength of 300 gf/25 cm, presumably at room temperature of 23° C, after the adhesive tape has been cured at only 40°C for three days (See Example 1, col. 9, lines 8-11). The different experimental conditions negate the Examiner's attempted comparison of Senoo's PSA strengths with Applicants' claimed PSA strength range of 400 g/20 mm or less.

The reason why the adhesive strength is defined to be not greater than 400 gf/20 mm is that this order of adhesive strength is the maximum allowable level at which the molded article can be easily peeled off the adhesive tape. When the adhesive strength of the adhesive tape is greater than about 500 gf/20 mm, the finished PKG can be easily destroyed rather than easily peeled off the adhesive tape when peeled by force.

In general, in ordinary transfer molding, resin encapsulation is conducted at a temperature of from 170°C to 180°C to melt and fluidize an epoxy resin. Therefore, evaluation at a temperature after being heated to about 180°C or higher as claimed in the present invention is essential, and the discussion of characteristics at a temperature of 40°C as in Senoo gives no significant figures for the purpose of mold masking. Thus, Senoo does not teach or suggest at least the claimed PSA strength of 400 gf/20 mm or less at 23° C after the adhesive tape is heated at up to 180° C or higher, followed by cooling, and the other references fail to make up for Senoo's deficiencies.

Applicants submit that dependent Claims 6-19 are patentable for at least the same reasons given for the patentability of independent Claims 1-2 above. Secondary references to Wang, Kraft, Fjelstad, and Oida fail to make up for the deficiencies in Mostafazadeh, Lin and Senoo.

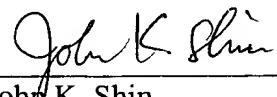
Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a).

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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